

Knowing El Niño:

Integrating knowledges of

managing climate variability in the

eastern Australian rangelands

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Declaration

This thesis contains no material that has been accepted for the award of any other higher degree or graduate diploma in any tertiary institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

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Abstract

Climate variability in Australia's rangelands leads to large swings in agricultural productivity from year to year. Contemporary policy has framed such variability as a manageable risk and Australian governments have fostered the development of a scientific community to assist farmers and graziers to manage climate risk via models, predictions and various information products. Meanwhile, farmers and graziers make decisions on the basis of diverse forms of information and knowledge. This thesis is a qualitative analysis of the knowledge boundaries among these scientific and lay communities.

I conducted the research in three parts. Firstly, I undertook and analysed 35 in-depth, semi-structured interviews with Australian scientists involved in research, development and extension of climate-related risk management tools. These technologies are based on climate models, which predict the impacts or dynamics of the El Niño Southern Oscillation (ENSO) and other major climatic fluctuations. Many are also reliant on systems models, which link the climate models to particular agricultural and geographic contexts. Secondly, I conducted and analysed interviews with 70 graziers in the semi-arid rangelands of eastern Australia. Thirdly, these two analyses were brought together with a re-constructive goal: to inform institutional practices and foster improved integration of scientific and lay knowledges concerning climate variability and rangeland management.

The discourse analysis focused on matters of epistemological and ontological substance. On the one hand, I investigated *how* climate variability and predictability were constituted by participants. On the other, I analysed *what* these constitutions of climate reveal about participants' positioning with respect to particular knowledge claims, identities, discourse and institutions. Following a detailed discussion about how scientists and graziers constituted climate variability, I conclude by positing that climate knowledges, made mutually by scientists and graziers, become mutually useful. I detail five principles which will

enhance such mutual knowledge production across the relevant domains of research and practice, as follows:

1. Framing the problems associated with managing climate variability needs to be done deliberatively, involving both graziers and scientists.
2. Articulating diverse socio-environmental concerns in addressing problems requires integration of social and biophysical science.
3. Reflexivity and humility should be explicitly emphasised as elements of scientific praxis in this public good science.
4. Scientists should include and closely examine the placed knowledges of lay actors.
5. Integrating extension with research and development will make scientific knowledge-making more effectively targeted and adaptive.

Table of contents

Declaration	ii
Abstract	iii
Table of contents	v
Table of figures	vii
List of acronyms	viii
Acknowledgments	ix
Preface	xi
 Chapter 1 – Introduction: negotiating climate variability	 1
1.1: Climate knowledges of rangeland graziers and scientists	4
1.2: Knowledges in action: the significance of the research	7
1.3: The story in brief	11
 PART 1: HISTORICAL AND THEORETICAL CONTEXTS	 15
Chapter 2 – Historical context: climate variability, sciences, graziers, and the politics of drought and the semi-arid rangelands	17
2.1: Scientific knowledges for managing with climate variability in the rangelands	18
2.2: A context for grazer knowledges	39
2.3: Conclusion	46
 Chapter 3 – Theoretical and analytical framework	 49
3.1: Epistemological positioning	50
3.2: Discourse analysis	58
3.3: On knowledges, integration and boundaries	67
3.4: Risk knowledges	83
3.5: Place knowledges	96
 PART 2: CLIMATE RISK TECHNOLOGISTS: METHODS, ANALYSES, AND DISCUSSION	 105
 Chapter 4 – Methods one: engaging with climate risk technologists	 107
 Chapter 5 – Knowledge boundaries in climate risk technologies	 121
5.1: Making seasonal climate predictions: an analysis of boundary-work	124
5.2: Matters of concern in the construction of climate predictions	134
5.3: Conclusion: story-lines of concern	155
 Chapter 6 – Extending climate	 159
6.1: The discursive extension of climate	164
6.2: Extending a conceptual climate	173
6.3: Extending climate variability in context	184
6.4: Conclusion – evaluating the conceptual, contextual and discursive extension of climate risk	199

PART 3: GRAZIERS: METHODS, ANALYSES AND DISCUSSION	205
Chapter 7 – Methods two: engaging with graziers	207
Chapter 8 – Grazier knowledges and the management of climate variability in the rangelands	221
8.1: Knowledge-ways as context for scientific intervention	222
8.2: Making sense of seasons	227
8.3: Climatic place: climate knowledge-ways in the rangelands	248
8.4: Conclusion	251
Chapter 9 – Climate extended	253
9.1: Narratives of application, contestation and rejection	255
9.2: Conclusion: forecasts and values:	273
PART 4: INTEGRATING KNOWLEDGES	277
Chapter 10 – Integrating climate knowledges in practice and theory	279
10.1: Climate risk and uncertainty, variously constituted	280
10.2: Boundary-work, objects and actors: towards a reflexive public good science	285
10.3: Five principles for a better public good science	290
Chapter 11 – Conclusion	299
References	307
Appendix 1 – Interview guide for climate risk technologist participants	337
Appendix 2 – Interview guide for grazier participants	341

Table of figures

Figure 1.1. Schematic of the thesis structure	3
Figure 2.1. The Hydro-illogical Cycle	20
Figure 2.2. Paired examples of seasonal forecast maps during an El Niño event in September to November 2006	29
Figure 2.3. The five SOI phases	31
Figure 3.1. The certainty trough	84
Figure 6.1. Typification of the characteristics of the three modes of climate extension as developed in Chapter 6	201
Figure 7.1. Map of Australian annual rainfall variability	209
Figure 7.2. Percentage of years with more than average rainfall (1st April to 31st March) for three year types: a) 'El Niño'; b) 'neutral'; c) La Niña	210
Figure 7.3. The location of the three rangeland study areas over-layered on a map of annual average rainfall	211
Figure 7.4. Rainfall climatology for Longreach Airport	212
Figure 7.5. Rainfall climatology for Bourke Post Office	213
Figure 7.6. Rainfall climatology for Hillston Post Office	214
Figure 8.1. Natural indicators mentioned by participants	239
Figure 8.2. Who participants mostly talk to about climate variability	243

List of acronyms

ABC	Australian Broadcasting Corporation
ABoM	Australian Bureau of Meteorology
AWI	Australian Wool Innovations
BMRC	Bureau of Meteorology Research Centre
CSIRO	Australia's Commonwealth Scientific and Industrial Research Organisation
DSS	Decision Support System
ENSO	El Nino Southern Oscillation
IPO	Inter-decadal Pacific Oscillation
LWW	Land, Water & Wool, Commonwealth Government and AWI funded research program, a sub-program of which supported this research
MCVP	Managing Climate Variability Program, Commonwealth and RDC funded research program focused on assisting primary producers to manage climate risk
MJO	Madden Julian Oscillation, an intra-seasonal influence Australian rainfall, especially northern Australia
NCC	National Climate Centre, part of the ABoM
NSW Ag	New South Wales Department of Agriculture
QCCA	Queensland Centre for Climate Applications
QDNR&M	Queensland Department of Natural Resources and Mines
QDPI	Queensland Department of Primary Industries
RDC	Research and Development Corporation, primary producer funded organisation which invests in agricultural research
R,D&E	Research Development and Extension
SSK	Sociology of Scientific Knowledge
SST	Sea-surface temperature
STS	Science and Technology Studies
ToT	Transfer of Technology, a top-down agricultural extension model

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Preface

In 1997 I rode a bicycle across the rangelands of Australia, through western New South Wales and South Australia. The country and its denizens got under my skin. The remoteness and enormity of the inland was beyond my expectation and changed the way I thought about being and knowing in this vast land. The quiet bustle of outback lives – of ants, plants, kangaroos, sheep, and those very few people – appeared differently connected, perhaps more so, than was apparent in the relative density of the eastern seaboard. Something else affected my thinking: the seed was planted when an attendant at a service station in a small outback town said to me, in passing, “if the man on the land is happy, everyone out here is happy”. It was a comment about climate; more specifically about the inter-linkages between climate and society. The inference was that the seasons go a long way to making the mood of a place. This idea got me thinking about climate and culture; how people live with climate and make sense of it. The urgent concerns about climate change – about mitigation and adaptation – appeared to me unanswerable without first understanding something of how we come to know climate in very personal, social and cultural ways.

Returning home to Tasmania, I was intrigued by the notion that Aboriginal Tasmanians had lived through extreme conditions in the most recent glaciation. I read a variety of archaeological papers and books in which the rudimentary material technologies of the Tasmanian Aborigines were sketched. I started an Honours project, intending to reconstruct the human thermal environments of Tasmania during the Holocene. My undergraduate background in physical geography led me to look at the problem as a biophysical one. However, it was quickly apparent that the palaeo-data were too thin to model human thermal environments of the last glaciation. With time pressing, I decided to use instrumental meteorological data to map contemporary thermal environments. By getting close to a series of biophysical models in this project, I began to understand some of the complexities, uncertainties and limitations that infuse such modelling. I grew more interested in how these abstracted, modelled

worlds could become part of people's lifeworlds. The proliferation of contending models and scientific claims based on them appeared to thwart the authority of such science. As a well-known Australian ecologist, the late Peter Cullen put it: "For every PhD there is an equal and opposite PhD" (Pers. Comm. 2004). In such a setting, I wondered, how do spatial predictions interact with placed reckonings? How do people go about making sense of climate? How is this sense-making informed by diverse outputs of science and technology? Such epistemological questions imply diverse story-lines of proximity and distance, between people, their different forms of knowledge, and their ways of knowing. Such story-lines are followed-up in this thesis. It is itself a story about climate knowledges, risk, uncertainty and place, and how people make sense of the seasons.